Nanostructured, Rechargeable Solid-State Composite Batteries

UNIVERSITY OF COLORADO

TECHNOLOGY
TRANSFER
OFFICE

Boulder + Colo. Springs 4740 Walnut Street Suite 100 Campus Box 589 Boulder, CO 80309

(303) 492-5647

Denver + Anschutz Medical Campus 12635 E. Montview Blvd Suite 350 Campus Stop F411 Aurora, CO 80045

303-724-0221

www.cu.edu/techtransfer

IP Status:

Available for exclusive or non-exclusive licensing.

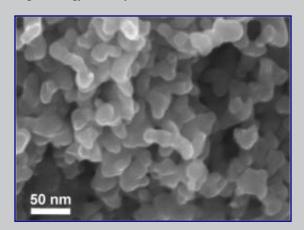
Case Manager:

Ted Weverka ted.weverka@cu.edu Ref # CU2304B

Background

Research on all-solid-state rechargeable lithium batteries has increased considerably in recent years due to raised concerns relating to safety hazards such as solvent leakage and flammability of liquid electrolytes used for commercial lithium-ion batteries. As solid state electrolytes by nature do not carry the safety burdens of liquid electrolytes, an extensive worldwide effort is under way to produce a viable substitute solid electrolyte to replace conventional liquid electrolytes. Unfortunately current research has yet to unveil a solid state electrolyte that can outperform liquid electrolyte.

Solid-state batteries are based on solid-state ionics, built from solid electrodes and solid electrolytes that conduct due to the movement of ions through voids. They act as a battery because they conduct ions but act as an insulator toward electrons. Ionic conductivity creates minimal internal resistance within the battery, allowing for high power densities. On the other hand, the electronic resistance creates a low self-discharge rate, improving the life of the battery. Solid-State batteries can be made on very small scales and can tolerate major changes in temperatures. One of the major downfalls of current solid-state batteries is the difficulty of getting high currents across a solid-solid boundary, resulting in low power-density and high-energy density.



Technology

A research team at the University of Colorado at Boulder led by See-Hee Lee and Conrad Stoldt has developed solid-state nanocomposite batteries that overcome some of the limitations of solid-state batteries. These batteries have a super ionic conductor and a high energy nanocomposite that make up the electrodes and electrolytes (pictured above). The result is a battery with ultimate safety, elevated temperature operation, as well as a high power-density and high energy-density. This new technology has a higher power-to-weight ratio than existing automotive batteries in use, making it ideal for use in electric-vehicles, other sectors of the transportation industry, as well as in the space industry.



Key Document

"A Solid State Battery." Provisional patent application filed August 18, 2010; available under CDA.